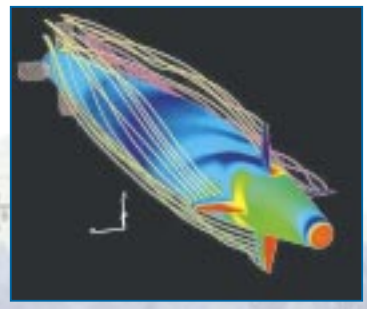
SMART MUNITIONS TECHNOLOGY

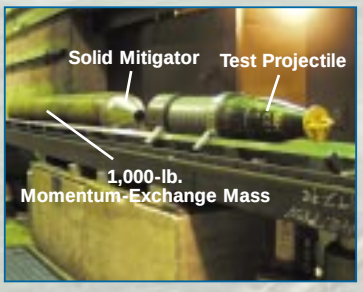
MULTIDISCIPLINARY DESIGN FOR ENHANCED LETHALITY



Advanced Flight Controls

ARL is pursuing a multidisciplinary research program aimed at developing technologies to support a variety of precision engagement munitions delivered by conventional and future air and surface weaponry. Specific research areas include aerodynamics and flight control mechanisms, structural dynamics simulation, metal-matrix and polymer-matrix composite structures, high-G guidance, navigation, and control components, microdynamic characterization of electronic components, smart control surfaces using advanced materials, and weapon analysis modeling.

High-G Munition Component Integration



High-G Gun Launch Simulation

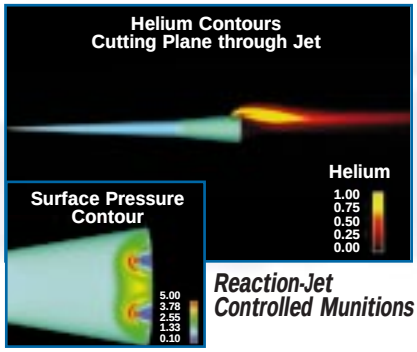
This research transitions state-of-the-art models, advanced prototyping, engineering, and multi-disciplinary design tools necessary for cost-effective development of advanced guided projectiles, rockets, and missiles to the armament system development community (i.e., the Army's Research, Development, and Engineering centers and weapon system contractors). The strategic goal of the program is to bring advanced multidisciplinary physics-based modeling technology to munitions for Future Combat Systems. These high-fidelity physics-based models of the complete munitions system integrate flight-vehicle structures, aero-dynamics, advanced materials, G-hardened electronics and guidance, navigation, and control components to maximize target effectiveness.

Metal-Matrix and Polymer-Matrix Composite Materials for Lightweight High-Strength Structural Components

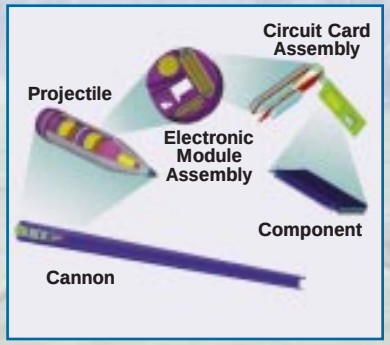
SMART MUNITIONS TECHNOLOGY

Guidance, Navigation, and Control Component Characterization

The strategy is to integrate advanced physics-based technologies into effectiveness models for munitions. The models allow complex munitions systems to be studied and visualized within high performance computational environments to determine the interaction of critical engineering parameters. Thus, detailed design tradeoffs can be performed on all system components, enabling the optimization of the munitions system as a whole. For example, through the coupling of the computational structural model for the flight body with the computational fluid dynamics loads along the trajectory while the rigid body dynamics are computed in parallel, the entire structural response to a mission can be visualized. Critical structural failure loads are identified so that the system can be redesigned before any hardware is manufactured. Thus, munitions are optimized in a multi-disciplinary mode before expensive hardware is tested. The models can also be used to design flight testing to achieve optimum data return. The models can also be used to feed combat effectiveness studies to verify that the actual engineering designs of the munitions systems are meeting operational requirements.



Reaction-Jet Controlled Munitions



Structural Modeling of Smart Munition Systems

Munition/Component Flight Simulator

ARL's Smart Munitions Program is designed to enhance the engineering fidelity of smart munitions models and integrate them into system effectiveness studies. This will allow "smarter" acquisition decisions earlier in the program, prior to testing and development.`

FOR FURTHER INFORMATION

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